

**REMARKS**

The applicant respectfully requests reconsideration in view of the following remarks. The applicant has amended claims 28, 35, 41 and 59 in order to overcome the 35 U.S.C. 112, second paragraph rejections. Support for the treatment in step D) in claims 28 and 49 (a partial hydrolysis of the organic phosphonic acid anhydrides being present) can be found in the specification on page 20, line 24-34. No new matter has been added.

Claims 28 and 29-55 and 59-60 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The applicant has deleted the parenthesis in step D) of claim 28 as suggested by the Examiner.

Claim 35 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. With respect to the definition of R or R' in claim 35, the Examiner is correct with his interpretation of claim 35 that R and R' must contain from 1 to 20 carbon atom and the non-carbon atoms are not limited. The applicant gives some examples of C<sub>1</sub>-C<sub>20</sub> carbon – containing groups at page 5, line 19 through page 6, line 20.

Claim 41 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The applicant has amended claim 41 and believe that claim 41 as amended is in compliance with 35 U.S.C. 112, second paragraph.

Claim 41 (per pages 11-14 indicated as Claim 41, as discussed above) is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The applicant inadvertently had two claims numbered as claim 41. The Examiner is treating the second claim as 59. The applicant appreciates the Examiner correcting this.

Claim 59 (per page 15 previously applicable as Claim 41, as discussed above) is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The applicant has changed "and/other" to "and/or" in claim 59.

Claims 28-58 and pro-tern Claim 59 are rejected under 35 U.S.C. 102(b) as being anticipated by Kiefer et al. (WO 03/074597 as interpreted through PCT/EP03/02397, US filed US 2005/0118477) (US '477) as enabled by DE 10117687.2 corresponding to DE 10117687 [published 17 October 2002] as interpreted though US filed US 2004/0127588 to Calundann et al.) (US '588). Claim 28 was rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 28 or of copending Application No. 10/584,965. The applicant respectfully traverses these rejections.

### I. The Instant Invention

The instant claim 1 is directed to "a proton-conducting polymer membrane based on polyazoles which is obtained by a process comprising

- A) mixing one or more aromatic tetraamino compound(s) with one or more aromatic carboxylic acids or their esters, which contain at least two acid groups per carboxylic acid monomer, or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids in organic phosphonic acid anhydrides with formation of a solution and/or dispersion,
- B) applying a layer using the mixture in accordance with step A) to a support or to an electrode,
- C) heating the flat structure/layer obtainable in accordance with step B) under inert gas to temperatures of up to 350°C with formation of the polyazole polymer,
- D) treatment of the membrane formed in step C) until it is self-supporting"

It is essential to understand that the "treatment" in step D) is a partial hydrolysis of the organic phosphonic acid anhydrides being present (see specification on page 20, line 24-34) and the organophosphonic acids stay in the membrane.

### III. The Prior Art

Claims 28-58 and pro-tern Claim 59 are rejected under 35 U.S.C. 102(b) as being anticipated by US '477 as enabled by US '588. US'477 refers to a polymer electrolyte membrane which is obtained by swelling a polymer film, such as PBI, with a liquid comprising vinyl monomer having a sulfonic acid group (which is responsible for the later proton conductivity but such groups require water for providing conductivity whereas the applicant's system is a high temperature proton conductive material).

There is no teaching provided with respect to forming polyazoles in organic phosphonic acid anhydrides, forming a cast film, treating such film for having the partial hydrolysis.

Claim 1 of US '588 states:

1. A proton-conducting polymer membrane based on polyazoles which is obtainable by a process comprising the steps
  - A) Reaction of one or more aromatic tetramino compounds with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer, or of one or more aromatic and/or heteroaromatic diaminocarboxylic acids in the melt at temperatures of up to 350° C., preferably up to 300° C.,
  - B) Dissolution of the solid prepolymer obtained as described in step A) in **polyphosphoric acid**,
  - C) Heating of the solution obtainable as described in step B) to temperatures of up to 300° C., preferably up to 280° C., under inert gas to form the dissolved polyazole polymer,
  - D) Formulation of a membrane on a support using the solution of the polyazole polymer from step C), and
  - E) Treatment of the membrane formed in step D) until it is self-supporting. (emphasis added).

The "treatment" in step E) of US'588 is the partial hydrolysis of the instant step D) (see paragraph nos. [0063] and [0064] of US '588). However, the instant invention uses organic phosphonic acid anhydrides being present (see specification on page 20, line 24-34) and the organophosphonic acids stay in the membrane, whereas US '588 uses polyphosphoric acid (PPA) instead of organic phosphonic acid anhydrides(see paragraph nos. [0063] and [0064] of US '588).

In US'588 the same kind of polyazoles is formed. The process steps, in principle, are the same as in the instant invention. However, US'588 uses Polyphosphoric Acid (PPA) in step A) which remains present in later steps. Finally, such PPA is at least partially hydrolyzed. In contrast, the instant invention uses organic phosphonic acid anhydrides in step A) which remains present in the later steps. In step D) such organic phosphonic acid anhydrides are at least partially hydrolyzed.

It is essential that there is and remains an organic radical of the phosphonic acid after hydrolysis of the anhydride, second the hydrolysis forms phosphonic acids (R-P<sub>0</sub><sub>3</sub>H<sub>2</sub>). Phosphonic acids are different from Phosphoric acids (H<sub>3</sub>PO<sub>4</sub>) (which is the hydrolysis product of PPA). Hence, the hydrolysis product in step D) differs in at least two features, namely having an organic radical and being a Phosphorous (III) acid any not being a Phosphorous (V) acid (oxidation state III vs. V).

There is NO disclosure/teaching given to use (i) an acid having an organic radical and (ii) to use a Phosphorous (III) acid instead of a Phosphorous (V) acid. For the above reasons, this rejection should be withdrawn.

Although an obviousness rejection was not made on the combination of US '477 in view of US '588, in order to expedite prosecution the applicant does not believe that this rejection should be made for the following reasons. The problem underlying the instant

invention was to find polymer electrolyte membranes being suitable to operate at temperature above 100°C and which exhibit a low overvoltage (over potential), in particular at the cathode were water is being formed in the fuel cell during operation (see specification on page 2, lines 21 to 27).

The applicant solved the problem by using organic phosphonic acid anhydrides during the formation of the respective polyazoles instead of polyphosphoric acids.

There is no teaching provided in the US '477 or US '588 that use of (i) an acid having an organic radical and/or (ii) a Phosphorous (III) acid instead of a Phosphorous (V) acid would solve such problem.

A statement that modifications of the prior art to meet the claimed invention would have been “obvious to one of ordinary skill in the art at the time the invention was made” because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). See MPEP § 2143.01 IV. “[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007) quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Furthermore, the Examiner cannot selectively pick and choose from the disclosed parameters without proper motivation as to a particular selection. The mere fact that a reference may be modified to reflect features of the claimed invention does not make the modification, and hence the claimed invention, obvious unless the prior art suggested the desirability of such modification. *In re Mills*, 916 F.2d 680, 682, 16 USPQ2d 1430 (Fed. Cir. 1990); *In re Fritch*, 23 USPQ2d 1780 (Fed. Cir. 1992). Thus, it is impermissible to simply engage in a hindsight reconstruction of the claimed invention where the reference itself provides no teaching as to why the applicant’s

combination would have been obvious. *In re Gorman*, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991). For the above reasons, this rejection should not be made.

**Double Patenting Rejection**

Claim 28 was rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 28 or of copending Application No. 10/584,965. In response, Applicants have filed herewith a Terminal Disclaimer. Accordingly, Applicants respectfully request that the double-patenting rejection be withdrawn.

The filing of a Terminal Disclaimer to obviate a rejection based on nonstatutory double patenting is not an admission of the propriety of the rejection. The "filing of a Terminal Disclaimer simply serves the statutory function of removing the rejection of double patenting, and raises neither a presumption nor estoppel on the merits of the rejection." Quad Environmental Technologies Corp. v. Union Sanitary District, 946 F.2d 870, 20 U.S.P.Q.2d 1392 (Fed. Cir. 1991). Accordingly, Applicants filing of the attached disclaimer is provided for facilitating a timely resolution to prosecution only, and should not be interpreted as an admission as to the merits of the obviated rejection.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 15588-00048-US from which the undersigned is authorized to draw.

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Respectfully submitted,

Electronic signature: /Ashley I. Pezzner/  
Ashley I. Pezzner  
Registration No.: 35,646  
CONNOLLY BOVE LODGE & HUTZ LLP  
1007 North Orange Street  
P. O. Box 2207  
Wilmington, Delaware 19899-2207  
(302) 658-9141  
(302) 658-5614 (Fax)  
Attorney for Applicant

Enclosure: Terminal Disclaimer